Notebook, PN-07-00-00.2

This undated pocket notebook was used by Edison, probably during 1907. It includes lists and descriptions of experiments to perform, reminders about patent and business matters, and notes taken from a book or books on the recovery of silver from nickel and cobalt ores. Many of the experiments pertain to the composition and manufacture of storage battery components and to related chemical researches. Others deal with phonograph reproducers, the composition of phonograph record blanks, cement kilns, and electromotographs. Also included are a number of speculative notes on the properties of light, the nature of electricity, and the use of cocaine as an anesthetic. Among the employees mentioned in relation to individual experiments are Ralph Arbogast, Thomas D. Greenley, Walter E. Holland, Frederick P. Ott, Ludwig F. Ott, and Charles N. or Albert F. Wurth. Employees mentioned in regard to other matters include Frank L. Dyer, Walter S. Mallory, John V. Miller, and H. I. Moyer. In one case Edison considers notifying Dyer about filing a patent application on a method for making metallic flake for storage batteries. Elsewhere there is a reminder to write Mallory about bauxite and a blast furnace. The pages are unnumbered. Approximately 100 pages have been used.

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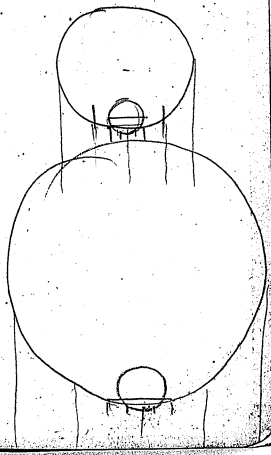
PN-(07-00-00.2)

K&T



Thiosulfate Na
Diss Ag + Au metallic dilts
AgCl - 100 gms dilts
54 Cent or Lead diss Au
precip by Na Sulfide -

Strangers in Sodium Copper Thiosulfate

1/4 pt by wt Na Thiosulfate 1 pt
by wt Cu Sulfate.
Don't Keep - make as wanted.
Thus Sol diss Ag metal several
times gm makes clean sample
Thiosulfate diss Au about
same as Sulphide Thio
Probably invented by Forrester 1904.

Slags -
proportion of ferrous ox should
not exceed 50% otherwise
danger of gelling now in
Matte or Speiss & shunted

not fall below 24% as the
Energy bonus which must take
the place of the iron reduce the
slag too refractory.
Specg of slag not Exceed 3.6

Silica	Ag & Mn	Ca Mg Ba	Total
28	50	12	90
30	40	20	90
33	33	24	90
35	27	28	90
34	50	12	96
33	36	16	85
30	36	20	86
36	40	20	96
32	33	23	88
40	34	26	100

	European	Ore	Record
Si	28.14	27.05	27.02
Fe	37.23	41.21	40.1
ZnO	7.60	8.62	10.1
PbO	7.35	3.90	5.7
CaO	0.50	1.03	
Al	5.78	6.82	
Ca	7.68	8.84	
Ba	3.97	0.90	
Mg	0.63		
S	2.47	3.53	

Ferrous chl produced by adding
120 pts NaCl by weight to
1000 pts Wales & then 280 pts
Ferrous Sulfate added after the
Solution was separated from the
Na Sulfate which crystallized
out another 200 pts NaCl
added. Stir the ore in this
Sol heated to 70.C. The
Co Ni dissolves + Fe precipitates
probably arsenic also
possibly Ag due of not
Could be due not of residue
fully by Thoroughfare or Eaton Cone
#2904 - Hunt + Douglas - They
had trouble with Hydrates.
They also had to get Ag out
of Excess Salt Sol.

Sec of Sulfate Sol from Bi, Ni, Co, and
when need of full arsenic have
arsenic precipitated by Metallic Iron
but also by water by prov.
but to add SO_2 to reduce the arsenic a

Possibly Cobalt flake will
not reduce an ammoniacal
Sol of Copper hence can
be used for dissolving out
Copper Tryst,

H_2S made by reducing Na_2SO_4
by Coke, then passing CO_2
through it Carb. Na being
the byp. product,

If arsenic exists in Co Ni or Co
anode with neutral Sol it entirely
goes into the alimes but if acid
solution it is gradually dissolved
as arsenic acid by precipitating precipitates.
If there is OK then are completely in
Co would be OK after ignition to
Oxide, reduction to anode or
replating in neutral Sol to get
rid of the As. ?
If Sb present it dont deposit in
acid Sol but does in neutral
So it would have to be eliminated

Use the Co Sulfate Sol with all the
Ni in + electrolyze it use Pb anode
a Cu Cathode then Copper values
only - used Sol. Deposits Cu +
Sb but - Current density
33.5 amp per sq. ft yield
This is used at Mahefund on
Cu Co Ni Spent Containing Chrome
but for Sb Bi + Sb
Not Co Ni Mn Co Zn Zinc

Hours considerably shortened
Hot Cure Sol with
Cooled Sol with

Not time for Cu

Take some Co sol reg a by precip by Cust Soda wash tube if as in it

The probable chief action of dilute SO_2 soln in Reg Cor I decomposes the $Ag_2Ag_2O_3$ + Silver metal. Try the residue after washing well add Sodium Cuprous Thiosulphate warm acc of dis Silver – precip by Na Sulphide –

Arsenious Oxide Volatilizes at 218 Cent.

Arsenite of lead (precipitate quickly compound) that is stable at a high red heat, ~~precipit~~

Arsenic acid at red heat is decomposed giving As_2O_3 + free O

Act on ore with Conc H_2SO_4 hot use excess acid, then dilute & act on fresh ore to neutralize acid then use Conc acid on fresh ore to dis Ag + Sn ore.

Monohydrated H. SO_4 Gal at

1.85 BP	326 C		Baume
1 801	238		
1.75	210.	1.84	66
1 68	186	1.72	60 Baume
1.65	177	1 61	55
1.52	143	1 52	50

Ignition Sulfates
Very high heat
Alkalis Mg. Pb.

Next are
Sb Zn Cu & Fe_2O_3 Sulfates

Very high temp necessary to drive off last remnants of SO_4
from Zn Cd Co Ni & Cu

If Bar has property of taking up more O it goes it from the SO_4 like Ferrous to Ferric & SO_2 evolved

Sulfate Sol. of Ag or many by precip by Cu Sulfide, HCl or even precipitate, HCl or Chloride

group 12 hours on
chg 12 dis
see if this holds —

Ag Sulfate - 1 part dissolves in

180 pts	Cold water		
.88 "	Boiling H_2O		
180 "	Cold H_2SO_4	10°	Baume
30 "	Boiling "	10°	"
20 "	"	20°	"
4 "	Cold H_2SO_4	60°	"
0.25	Boiling H_2SO_4	66°	B

Ag precipitated from Sulfate Sol by Metallic Copper
If Bi is present it forms insol Basic Sulfate of Bi & Ag
or Basic Ag when Cu & Sb present
Silver forms Chloride & Carbonate
Ag - insol in water -

and also neutral
was 20 cc by

See if Co Sulfate Sol ~~rather~~ very Concentrated
is precipitated when poured into
Concentrated hot Sulphate Soda
If so filter hot & see if freed from
Als & other things - point precipitated
probably Na_2SO_4 33 deg Cent.
also try K sulphate in the same sol.
Try this with NaCl, Conc & hot.
Also $NaNO_3$. My SO_4 also.
See if Co Sol if exactly neutralized
by KOH, if it throws down anything
like Bi - etc -

Also try neutralizing by slopped lime
boiling & filtering until neutral -

When acting on a non-dis Carbonate
the ag Bi with the 30 cc SO_4
and dilute Nitric see if it
dis the Bi & Cy -

Spec g Smalltz 6.4 to 7.2
Prochite 7.32 to 7.67

$Na_2Sulfate$ melts at red heat to
a thin liquid spec g 2.690
perhaps if raw ore fused with it
lime the float out on top -
also see what effect fusing
the roasted ore with it, too

By igniting the Sulfate of Co Hi Fe
we get rid by dissolving the reg Co ore
the Fe Sulfate is decomposed at
a heat which dont affect the
other Sulphates - Then submit
with water - in all probability
the ferric ox thus obtained
will have combined with
the arsenic + thus the Solution
when precipitated contains
ferrous Sulfate so in Sol. I
will be freed of arsenic!
Zn SO_4 easily holds SO_4
opposite to oxide lime
(it also be stunned)
If not enough Fe SO_4 must
add it -

Holland-Islands, Zn precipitate from slow
ox Zn in large quantity of Arsenic bearing
Solution such as opt / Zn Arsenate
possibly it will not include the Co

Acid arsenite of Sodium
dont Cryptalogs - possibly
can point reactions the Reg
Co Solution from Cas I
with NaOH, then Cryptalogs
out the Co Ni the cobalt
any As2O3 chill it down

Heat roasted ore in Carb Potash
Melted, part reduced to metal
& part forms an Arsenite.
by releaching several times
perhaps all Co Ni can be
got as Oxides —

Use 1 pt Co Cas I Sol some free
acid add powdered Ferrous
Sulfide. hot, till all As precip
filter & roast - till Fe2O3
produced, Exhaust with
water & Cryptalogs -

Try Hyposulfite under iron

Residue -

1st Roast, reshaved with SO4 -

2nd Try dissolving Ag Bi out
with KCy - Hot Conc SO4 -
Russell's Sol, Dilute Nitric -

3rd precip Ag by SHCl, or Cu or Zn
Zn, H2S, - Water,

4 if any further remains dissolve
Aqua Regia + get out by H2S
+ take Co Ni -

Drg to make lot of 80 Fe
20 Bi; RA to reduce by
H add 5% Hg - 1 lot
next lot reduce to non pyropho
no Hg -
next lot reduce non pyropho
add 5% HgO Dry

Dr Cl make 80 Fe 20 Cu
RA reduce non pyropho
add 5% HgO Dry ✓

RA precip Fe Sulphate containing
some Sulphate to get ammon of
Fe OH + Sulphate Fe - reduce by
H non pyropho, add 5%
HgO Dry

RA - precip FeSO4 80 ✓
MnSO4 20 - 1/2 wash dry
peroxide + reduce by H. 5% HgO

ditto to Non pyropho add
5% HgO Dry

10 Bi 80 Fe 20 Mn ✓
precip 1/2 wash pour off alc
oxalate acif heat. 5% HgO

ditto reduce non pyropho
5% Hg -

80 Fe 20 Chrome precip 1/2 wash
reduce
acif heat 5% HgO

ditto Non pyro 5% HgO Dry

80 Fe, 10 Bi 20 Chrom 1/2 wash
percolate, radium self heat.
5% HgO –

ditto non pyro 5% Hg Dry

ditto Molybdenum + Bi
same proportions

ditto Vanadium + Bi

ditto Vanadium + Cu same
proportion as with Bi.
5% HgO – self heat + non pyro

ditto 80 Fe 10 Bi 20 Tungsten
5% Hg –

ditto 80 Fe 10 Bi 20 Sb
1/2 wash self heat dry
5% Hg

80 Fe 10 Bi 20 Lead
self heat also dry
5% HgO

80 Fe 20 Tin
self heated also non pyro
5% Hg –

80 Fe 10 Bi 20 Tin
self heated + non pyro
5% HgO –

L Ott try piece spiegel
essen in K OH, anode

grang chgs. 900 - dry Reg
" " 100 "
" " 12 hours dry 12 -
" Run to boil 150 until steady
then 200 till steady - 300 till
steady -

To peroxidize sol containing 160
lbs Cobalt

320 lbs Bleach 30%	3.30
218 lbs Caustic Soda	5 00
144 " Na_2CO_3 -	3 00
Extras	1 50
	12,80

8c Pound -

Co from Ni
Sol - add slight amount acid
then Excess NH_4OH. Then ferricyK
ppt Co Ni not ppt -

ppt by Excess NH_4OH - wash - dry out
the CoS by KCy - Ni stays in Sol

Co superficially precipt by H_2S from
acetate or NH_4 containing Co.
Crooks spec p 265 -
positively removes the arsenic -

1 - grm arsenide fused with 8 times
its wt of equal pts S + Na Carb -
Exhausted by boiling water which
removes the As + Sb - leaves the
Sulfides -

1 pt arsenide mixed 2 pts solid
KOH + 1½ pts S - fuse to dull red
Water dis the double Na Sulfo
arsenate - leaves the Sulfide
Co + Ni

Took 20 grms Reg No 1 Cas
heated Monday 1/2 day with
dilute H_2SO_4 1200 Reg –
Evap dish 3/4 full Dolomite
Residue weighs 2.580
grms – (Thus always
17.420 grms dissolved)

4 more tests 3.510 } 3.510
3.510

grms in residue 3.290 } 3.475
3.475

The 1st Sol 2.580 was heated more
than the 4 last ones –

Bauxite brick for Helms
Lacledo Fire brick Mfg Co
St Louis Mo –

$ZnSO_4$ – Cry Mg system $7H_2O$ 6 atoms
given off at 100°C, last above 260°C
Wholly decomposed to ZnO at bright red.
Sol 2½ pts cold H_2O

$CuSO_4$ dec bright red heat to CuO
$FeSO_4$ " at red heat –
$PbSO_4$ melts at red heat without decomp
unless in contact with charcoal or SiO
then reduced to metal by iron
$MgSO_4$ melts red heat only part dec at high heat
$NiSO_4$ gives off – part of its acid at red heat

To test if arsenic acid is in
Sol, add basic acetate of
Lead, gives white precip –
Arsenate Pb –

Dyer – patent $CuSulfate$ NH_4
Sol for dissolving Copper
from Cobalt flake

Recy Fe plate, soak in Conc. Copper solution
& Precip by KOH + boil —
ditto, Reduce in H,
~~Keep~~ dip more than once — ditto B.
Probably mix Fe Reg with flake nickel
ditto's 941 842 743.
Look in note book find group non pure
+ have them Reversed,
Dr 9 make 5 10 20% Cermin with
the Fe. to be reduced H leaf no non pure 5/19

1000 grms of No 1 Cardboard
Glycerinning & washing To
200 meals & breakfast
with dilute HCl reduced
wt to 670 grms pure, 15 g fat or fibre
Glycerine will now roast,

Cupric O treated in Sol with
Containing KOH or NaOH +
Dissentions cand. the CuO
is reduced to Cu_2O +
arsenate K formed —
The Cu_2O can be dissolved
out by NH4

For Dust sep for kilns Shelves
Portland Cement — for brick —
Slate — Cast non-Cast for Blast
furnace slag — ditto puddling
furnace slag — Copper furnace
slag — steel make a silicate of
Iron slag — + cast plates.

for dis Cu out of Co Cu flakes
Use Cupric Ox dis in NH 4
molecular bottle — try
def strengths —

Try Co Cu flake in a new
Electrolyte, with Chl Cu
+ NH4 - say Alcohol
187° Acetone + other solvents -

Q. V Mellon thro 20 on 40
1 6 times Concentrate
Cair HCl - Wt 20 grms
Mean put in HCl, Lime
removed dried reweighed
18.700 93.5 Recov
6.5 % Tails of Lime in Conc

Complete analyses
No. 1 Cu lot of Underwing

Cobalt	8.00
Nickel	5.15
Arsenic	42.15
CO_2	13 33
CaO	17 30
Fe	3.55
Sol HCl Fe_2O_3	0 70
Al_2O_3	1 21
Insol Silica	4 17
Sulphur	0.85
Bismuth	0 30
Copper	0 30
MgO	1 02
MgO Sol HCl	0.15
Zinc, Antimony, Manganese	Traces
Tellurium	not yet det
Selen	
Moisture	

Extraction Ag from Co Ni ores by lead not now done, large loss Ag - wet process used
Cupulation furnace 11 tons lead used
Ag ores added 50 @ 100 lbs at time when PbO commences form, Impure PbO raked off.
air blast stopped ore Then thrown in ore floats, it partially roasts off As & S + partially eliminated, Ag reduced to metal by Pb. any residue on top bath fluxed by PbO, when slag fluid, raked off - cupulation proceeds by adding more ore - these operations may take place every ½ hour ½ ton ore added to bath of 11 tons

Milk lime, or Ferrous SO_4 used as binder of fines -

Ag_2S is not completely decomp by molten Pb.

Copper dis by H_2SO_4 + air - Cu granulated H_2SO_4 passed over it, film of acid left upon passage of air dissolves Cu

process intermittent, (warm)
Fe Ni Co dissolves Pb most residue
Sb Sn Bi form basic salts remains
principally in residue As partly goes into Sol as As_2O_3 + partly remains most Arsenates
Antimonates + Arsenates are decomp by Warm H_2SO_4 forming Antimonic + Arsenic acids
CuS also Au + Ag remain in residue -
Tower used lined with lead
false bottom air entering bottom
2 jets top, steam used Hot liquid
Every hours or two -
long trough used 360 ft - for 8 vats.
at end trough Pb Arsenate + Antimonate + gypsum form.
Most Ag found mixed at 1st end with Crystals $CuSO_4$ -

Careful roasting will permit $CuSO_4$ + $FeSO_4$ to be formed. By careful roasting heat, $FeSO_4$ decomp none of $CuSO_4$ is decomp - The $FeSO_4$ decomp to oxide & SO_3 ? -

With a mix of CuO + Fe_2O_3 a 3% sol of H_2SO_4 will dissolve Cu but no Fe when sol shown heated -
Density must not exceed 26 B otherwise pipes clogged with Crystals
Residue has all the Ag Au Pb
fulbrite may contain Co Ni As
Sb Bi + $CuSO_4$ - any Ag that may have gone into sol is reduced by $FeSO_4$ to metal,

Augustins Process.
Ag converted to chloride by roasting with salt, or dehydrated $FeSO_4$ -
AgCl dis out by NaCl - precip by Copper - 100 pts solid NaCl dis in H_2O take up 0.4 % AgCl another measure 1 litre saturated NaCl dis 0.45 grms AgCl and lump
" 1.27 at 19.6° Cent.
Calcium Cl + MgCl better solvents.
If Au present an after Exhaustion with Na or Ca thiosulfate is best to extract Au - Vats must be lined
Arsenates + Antimonates of Ag imperfectly dis + cause loss Ag
Necessary condition for success
Augustin process absence of Sb Pb except - small quantities

Patera process
Ore chlorinized roast. AgCl dis
not by Na Thiosulphate
Ag precip by adding Na sulfide -
precip by Copper not favorable
as Na Thio dis also both Ag + Cu
Ag S is however insol + inert of
Na S as precipitant - also regeneration
Na Thio -
Solvent powers of Na Thio for AgCl
100 times greater than NaCl -
100 pts Thio dis 40 pts AgCl.
Ca Thio about same 90 " " % of
Na Thio.
Thio decomposed the AgCl forms
double salt, Na Ag Thiosulfate
Patera process over should not
be used in Pb Cu or $CaCO_3$
Calcium goes to Caustic in roasting
reduces AgCl to Ag + diminishes
solubility of most Ag compounds
in Thio, lessening tendency of this
to form double salts. It also
precips Pb as hydroxide + coats
particles of AgCl with insol film
+ prevents dissolution —
Impure action to some extent of Pb + Cu
(prevents) by extracting Sol salts by
H_2O hot before moving Thio
Pb may be precip as Carbonate
before use of Thio to insol
Cu is extra impurity of Pb is present
because hard to separate from precip
containing Pb + Cu Sulfides than
if only Cu S + Ag S present —

Sb + As do not interfere
as it does in Cyanidation process
because Arsenates + Antimonates
of Ag give up their metal to
Thio
Any Metallic Ag present often
roast is dis by Thio

Through undecomposed Ag_2S or its compounds with Cu Sb Sulphides is not attacked by Thio –
Thio sol is rarely used to dissolve AgCl already existing in ore but generally used on ores containing simple or compound sulphides of Ag which have been Chlorid roasted –
This process not used for extracting Ag from metallurgical products –

Ag_3AsO_4 diss in warm Na_2Thio – diss 0.2 pts Ag for 1 pt Solid Na_2Thio –
Ag Antimonate requires 1 pt Thio for 0.05 of Ag
Solubility of Arsenate + Antimonate Ag considerably increased by presence NaOH.

$CuCO_3$ Pb Fe Mn Zn Ca Carbonates insol in Thio – Cupreous Ferrous sol but Cuprous + CuO oxides Fe & hydroxides Fe Mn + Zn not sol –
Cupric Chl diss with formation double salt $PbSO_4$ due to double salt $CaSO_4$ forms $NaSO_4$ & $NaCaThio$ + diss –
Cupric diss sol in NaOH + $NaCaTh$ produced. Its sol in Thio same extent as in H_2O.

Solubility of AgCl in Thio diminished by presence Pb + Na Sulphates + particularly by Caustic Alkalies + Alkaline Earths –

Kiss process Thio used process same as Patera, but Ag precip by CuS Cu from Thio being regenerated –

Russell process

Ag present in ore as simple sulphide or in combn with As or Sb sulphides or as arsenides or antimonides or in metallic state, with gold in dis by Sodium Copper Thiosulphate

Ag precip by Na_2S ref. –

in American works used as an auxiliary to Patera process

Extract 1st by Na_2Thio – then follows with Na_2Cu_2Thio the latter solvs dissolves any gold Ag in metallic state, or any sulphide arsenide or antimonide of Ag being also dis

Ja precip are Na_2Cu_2Thio $\frac{1}{4}$ pt by wt Na_2Thio 1 pt $CuSO_4$ with H_2O – makes a wanted – decomp – air Russell's salt also metallic Ag std and temp nine times wt 50°C $3\frac{1}{2}$ times faster than plain Thio –

Reason of increased solvent power due to Cu_2S set abslg O from air acting as a carrier of O the metallic gold is dissolved about same with Reg Thio –

Ag quickly decomposed by Na_2Cu_2Thio Cu_2S then precip & Ag goes into sol –

(Try this on crude ore ref.)

Claudet process, used on roasted pyrites for Sulphur –

precips Ag from liquors by Iodide K if Pb present Pb Iodide comes down also –

Gibbs process for precipg Ag from sol – uses H_2S + steps when 60% of the Copper has been precip as sulph Ag will be precip by this time) – precip roasted in partly yields Cu_2S pp

a pure Oxide = while ag
converted to chloride by action of
Chlorine left behind — Solution
— precip.
Roast + treat — Vale with H_2O then
hot Hcl which dis Agcl
Sol treated Milk lime all
heavy metals precip
from precip Cu dis by H_2SO_4
leaving residue with all the agcl

Andrus proposed blowing
from powder then leaving
ag reduced before the rest
of the Copper gets reduced —

Ziervogels process —

Converts Ag by roasting into $AgSO_4$
when Cu Fe sulphides present. very
Careful roast. $AgSO_4$ sol H_2O precip by
Copper —
Careful roast of Copper matte containing
not too great amount FeS — ferric SO4
is formed in addition to Fe + Cu oxides
as Temp is raised Fe_2SO_4 decomp SO_3
evolved, then + O of air brings about
formation of Fe_2O_3 — latter alone is stable
at temp where ferric SO4 decomp
increasing temp $CuSO_4$ decomp to
$CuO + SO_3$ or $SO_2 + O$ — SO_3 acts
by bringing hitherto undecomposed
ags. into $AgSO_4$ $SO_2 + O$ being
produced the O exerting powerful
oxidization in the ags.
Ag_2SO_4 is stable at temp where
$CuSO_4$ decomposes so if roasting
is carefully done product
is Ag_2SO_4 + oxides of Fe + Cu

If temp too high Ag_2SO_4 decomp –

If As or Sb present amounts of determinants of Ag formed in roasting have being insol in H_2O occasion loss of Ag. If Bi present it forms double sulfate with Ag_2SO_4.

presence of Pb & Sb sulfates causes sintered lumps makes unpaved roast

Hence this process depends on absence of As Pb Bi Sb compounds

1 part Ag_2SO_4 dis in 180 pts H_2O
" 88 " Boiling
" 180 H_2SO_4 10 B
30 " 10 B boiling
20 " 20 B "
4 " 60 B cold
0.25 " 66 B boiling

If Cuprous Ox present in roast ore Ag reduced to metal on dis in H_2O must be roasted to cupric Ox

Raw ores or speiss never worked by this process

From Dr Gruber's book

Roasting –
$FeSO_4$ decomposes 300 @ 400° C
Fe_2O_3 500 C from 500 To 600 C
basic + neutral sulfates decomp + completed –
Then Ag_2SO_4 forms + $CuSO_4$ begins to decompose
Zn Pb + Co. SO_4 stand between Ag_2SO_4 + $CuSO_4$ owing to stability
$MnSO_4$ decomp at higher temp
But 300 @ 400 C Copper equals as oxide, the $CuSO_4$ alone be thrown (by O_2) as it decomp
the Silver + Valty – Reducing actions are bad,
Ag can be revealed to Ag_2SO_4 except in atmosphere of H_2SO_4 – which in the C are so formed Ag decomp of $CuSO_4$
Flue dust contains 0.78 % Ag. Ag_2O evaporates due mostly to presence of other volatile oxide

Cyanide process

Ag or AgCl dissolved Hg + precipitated by Zn. Pb. or H Cl –
0.5% of .10 hours – then dilute with
dissolved 10 hours. Many strengths used.
HCl precips Au as AuCl
the weaker the sol. the more Au thrown down

Amalgamating Process

AgCl easily decomp by Hg – forms
Mercurous chl – Ag unites with Hg
Ag S slowly decomp by Hg
formation HgS more rapid in
presence Fe + also heating
As + Sb compounds of Ag slowly or
incompletely decomp by Hg alone
Decomp of AgCl by Hg causes loss Hg
best to use metallic Fe to decomp in
presence of Hg saves Hg

AgS ores are heated with metallic
Fe + Hg – or CuCl + Hg Either

alone or together with Fe Cu Pb
or Zn or else Ag chloridized roast
then treated with Fe or Cu + Hg
If ores contain As Sb. CuCl + Hg used
or CuCl together with Fe Cu Pb or Zn
+ Hg or roasted chloridizing + treated
with Fe or Cu in presence of Hg
Clay + magnesium silicates
in ore bad Coats mechanically
Gold more easy amalgamate Zn Pb + Bi
also amalgamate
As Sb alloy amalgamate with difficulty
Fe Co Ni not at all –

Amalgamation without Chloridizing
Roasting –
lead collect Ag speaks in form
of sulphide As or Sb compounds
or simple sulphide or haloid compound
Reagents being added in amalgamating
apparatus

Krohnkes Process
Hot sol Cuprous Chl in Common
Salt decomp by compounds
which are then reduced by Zn
Pb in form of amalgam
The Ag S As Sb compounds of Ag
are then reduced electrolytically
Zn + Cu are best for reduction
Fe Pb Sn more feeble action
more used by mercury and Zn
or as amalgam -
Fine grinding essential for this
process = Cuprous Cl obtained by
made as wanted, as it oxidizes quick
to Cupric Cl or oxyhl -
1 pt CuSO4 dis in 6 to 20 pts
Concentrated NaCl + H2SO4 to
amount of 0.5 to 1% of the
CuSO4 added to the solution

A better way is to add NaCl
to Sol of CuSO4 of 50 B so
long as it dis. Cupric Chl +
Na SO4 formed liquid heated by
steam + sheet copper used to
reduce Cupric to Cuprous
The free SO4 prevent forming basic
salts. The Cuprous Chl though
slightly sol H2O is readily sol in
NaCl - Solution ok as soon as
discolored -
Zn Amalgam - 1 Zn 10 Hg
heated together then treated Hg
squeezed out,

Barrells used pitch pine 3"
thick - Sticks across break up
ore, billied to help removing amalg

Iron vessels cant be used
1 Ton Sol to 3 Tons ore Strength
Sol 8% + salt used is 3% of wt
of the ore

3 tons ore requires 600 lbs H2O
Case taken that at 5.0 operation
there is a trace Cupreous chl
Afterwards vessel filled cold
lb water allowed to cool some
time & then rotated 1 to 2 hours
this unites the amalgam
Amalgam contains Cu & Ag

Amalgamating Spries
Roast then add NaCl & ferrous
SO4 & recast Ag converted into
AgCl & Au & Sb compounds of
Silver also converted into AgCl
FeSO4 accelerates the reaction
by giving off SO3 liberating HCl
& Cl from the NaCl the ferric Cl
combines chlorides of the Ag
400 lbs roasted ore 80%
NaCl & 20% dehydrated
Ferrous sulphate

Sulphate Cuprous
melts 284 F requires decomp
at 536 F. glass vessel corroded
& evolves HHF than water
& Nitrogen gas & disappears
entirely with sublimation of
Iron phosphate. HHF usually
generally (NH4)SO4

Sulphite NH4 is oxdzd to
Sulphate by magnesium ass
with F or dilutes with
lime & absorbed by H2SO4

Key precip Ni Sol in Excess
not altered when boiled in ass.
heated with Excess NaHypodiphosphate
Solution is mixed with Br in cold
gives precip black Ni2O3 hydrated

Co Bay on other hand sol in
excess key when boiled in ass
its changed to another Co & not precip
by NaHypodiphosphate or Br

Wad-

Solution nearly neutral mix with
Excess $NaC_2H_3O_2$ & small quantity
Acetic acid - heat to boiling & pass
brisk current H_2S in boiling liquid
Mn & Ur remain in Soln
Ni Co & Zn are precipitated

Rogshillin Electric Induction furnace
melting Cobalt -

Best Spec G for Crystallizing
$CoSO_4$ 1.390
$FeSO_4$ 1.280

Try Sources for separating Co & $NiSO_4$ from
Each other.

Try igniting Co & $NiSO_4$ together bright red
I know see of $NiSO_4$ decomp.

Ord Fe pyrites commence loss S
at 440 C chalcopy Magnetic pyrites
& Cu Nickles at 525 C Zn S at first
750 C 900 C must be separated
to decompose the $ZnSO_4$ formed

H_2O at 20 C contains 8.6% SO_2
at 100 C only 0.1%

Try Solution from zinc & first reduce silver
by Copper to then further - use only 1/4 of
Solution - then add Ag out. Test if
above left in solution - try another
put with HCl -

Slag for Iron Pyrites
2 pts Barytes 1 pt Charcoal
of this flux 18 times that of the
iron to be fluxed co
ucted - is very fusible
Ferrosilicate of Barium
is formed - Raw Sulphides
used - this flux drives off SO_2

Silica in sol can be precip out by
making Sol acid or adding
neutral Neutral Salt, Silicate of
Na is formed. This is used in
analytical reagent known as
Silica in Solution —

Well Cake Barytes precip Fe_2O_3
from Sulphates Co Ni Feds
In Sol - saw that it was
used in refining process
Carbonate precipitate $BaCO_3$ used
dirt heat liquid of not 60.°
How about Lime

Sulphur & Carbon melted
together gives off HS abundantly
glass vessel - very convenient as
convenient flame well known
HS strips, & flesh cambric get
used for fuses use —
say heat pint in pan please
broken balance pure —

Try roast ore with Slaked Lime
also with Ferrous Sulphate alone
dilute Ferrous Sulphate & Salt,
boil 200 weak ore with Hypochlorite
Soda,

Pass SO_2 over Dry Wood, dilute wood
then Ethanol water —

Pass HS through wood until all
Sulphur, then O dissolve out MnS
by dilute H_2SO_4

Do wood remelting with NH4-Y
pass HS for little while just to
throw down Ni + Co that Mn
as Mn has least affinity after S
of all metals,

See if SO_2 taken more Co than
Co Ni out of roasted Ore !

Take some of the Sulphur Co ore, which
was boiled down add them to
large quantity Conc SO_4 boil
then settle & decant to see if
SO_4 takes Co_2O_3 out

Dr G makes Potassio-ferric Sulphate,
the or double Salt,

Ammonio-ferric Sulphate (Ammonia Alum)
by mixing NH4 SO4 + Ferric SO4 + Little free H2SO4
Evap to crystallize

Cupreo-ferric Sulfate
$Fe_2 Cu''(SO_4)_4 + 24 H_2O$

Potassio Ferric Sulphate (Potash Alum)

Dr G to write method making
Sodium Ferric Sulphate with Dio
3rd Sept 1878

Make up 10 or 15 lbs
Na Ferric SO4 + have RCA
May Ex Hg 5 & 10% HgO
also Cu + Hg various
Proportions —
also 10 lbs K Ferric SO4

Resume pickup group
7000 NiOH 2000 Bi Oxide 1000 Ni filt.
2500 " 500 "
1500 " 1500 "
2000 " 1000 1/2 thick Ni filt.
all well mixed —

Don't forget pocket Nickelitic +
over this, Ag + Au Cu Bi
Trace of platinum Chloride.

Put up 80 Fe 20 Sn charge
fully then discharge +
Reverse it against Ni
strip in glass see if
Tin all comes out of
Cathode — Go Bismuth
charge until all tin
out of then run

Try Ferrous Pot + Bismuth Sulphate
with excess HgO

Make 2 grades
No 04 thru 30 —
" 40
50
60
70
80
100
150
200

times mill
mm —

also thru 20 with flake
Cut strips 50, + 60
wide — cloth 30 + 20
wide.

The different ways
of packing flakes + Nickel
"all same stuff
(1) Nickel 2

Take CuSO4 Mother liquor after
Crystals add K Sulphate add it must
take not than one of all the CuSO4
will crystalize out leaving the
H_2SO_4 & Al_2O_3 the behind
thus for a quick seperation

Zn dem NiHy Try ZnSO4
& NiHy to dem Copper

Several 1/16 spirals in iron
Cup — also 005 7/2 cups

Greenley Try making a
graphite Electrode in the
RCy Sol for Eating flakes
& Connect it as ~~anode~~
~~Cathode~~ & try Current
both ways also
Short Ckt & use no Current

Holland [illegible] Rare metals
[illegible] Mercury [illegible] & Cry
[illegible] [illegible] Lime,

Gold cold iron
Groups testing various $Ni(OH)_2$
~~Hg~~ [illegible] cell high Iron – Chart
~~Gold iron~~
~~Gold~~ ~~Hg Cu~~ Recovered once a week
Different trays handling
Green thro 20 30 40 50 fumes
Using good Co Hydrate and standard
use 8000 Co 1000 Ni [illegible] very thick
7000 " 2000
6000 3000
5000 4000
4000 5000
3000 - 6000
Punched sheets
tubes [illegible] iron –
New big pestle burs ground
Reg plating –
ditto ½ fires in acids

Re [illegible] ~~gent~~ up 6 N old Cups
8 [illegible] clay + dus [illegible] burns –
group with 10 KOH 11 K_2CO_3
15 " 6
KCl 10 grnts. cell 3 on group
all Hg Cl clocks, 5 burs
grand burgeff – ditto punched
tubes burs ground heavy Ni plating
3 rings 4 rings 5 rings

Iron mix with 6 6.5 7 7.5
run with H tubes –
ditto Hg Cu iron
" Bi Na HgO + with HgO
6 6.5 7. + 7.5

Jewels in devices of
Reports for phones
watch jewel plating

Dr Grotto distill
in Vac small glass offers
some yellows CP Beaumy

Dr Cy to lead Diabase Can I also
Greenley with Hydrofluoric for
Ag —

Aluminum Iron Condenser
Al Rectifier for Amos —
Elec with Rectifier for
Workers —
Emch. Cylinder of Al + pen of
rawhide or Carb Stoneware
or Fe_2Co_3 + Al pen —

Henley lay out 40/wood + 10/iron
see depth on both 1 with 10/iron other
5/wood — also 40/wood bottom +
10/iron bottom also. 8/ [illegible] of ball

Dr Cy Sulphonated fatty
Acids — for glass

see if that Cupola is
in lot across street
we used for glass —

Worth Mallory abt Bauxite also
to get price Phosphat for [illegible] Carbonate
Carbide + Gelson — [illegible] of [illegible]

Greenley use strain flakes as anode
Cu on Cathode + deposit the
Cu on Copper + then [illegible]
KCy lead for Co — Cu also Sulphate

Precipt Co as CO_2O_3
from Co + Ni sulphate
for 59 lbs metallic Co
requires 100 lbs bleach
159 lbs anhy Carb Soda
for 59 lbs Metallic Co

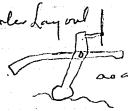
Make some tubes near open
burn off 005 2 3½ 3 lbs
press to stop burning
also new pinched Wales

tubes (Reg) [illegible] 18 KOH
3 K_2CO_3 16 KOH, 5 K_2CO_3

13 KOH, 8 K_2CO_3 - Embrittlement
+ splitting tests

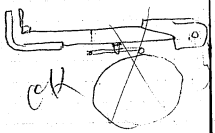
Oppy - How about mentioning
in letter 200 thread a spacer
hand on from some of your
+ clean Contr

Handle Long end



as against Reg lever

Worth

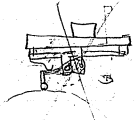


Recommended
Use adapter

OK

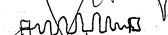
OK

Wheal



OK

OK

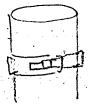


Very deep

Big amplitude

Smaller slope
Shaft

allow tube swell



ship shut.

oval see high capacity tube

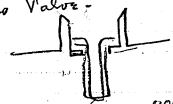
Use porous cup & 21% Electrolyte for ½ hour then put in $CuSO_4$ see if precip. turns black if so try it close then put in solution —

group with 8 Rings on tubes with even bore & halve any 1/16th + 1/16 apart —

Try all groups & magnetism also measure the one with free gas

flat spiral wound around wound smaller then tube + then alternately over the dif pitches, + middle

piece porous cup for gas valve —

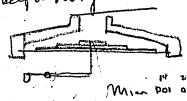


also open

+ dep in water —

Set up 2 groups each with 7 = 80 Tin 20 Non pyro H_2O_2 + without Hg —
ditto 7 = 80 Sb 20 Non pyro H_2O_2 5% + without Hg —
Lets Bismuth Non + no Hg

also 50 Fe 20 Tin 10 Bi
Self Melting —



1st 2nd
Min .001 .003 .005 .010

Fac seems to slip like an anti-spring but riveted in center —

Average 2 to 1

Hallam —
Boil a cell (old) 10 hours for 2 or 3 days —
ditto with 5 amp
Rev —

Try 2 grams Dryfleet Co flake cell fuse not reduced Hydro Fu —

Cl	27.01	I	126.55	Sr	87.37
Sb	119.96	Ir	192.65	S	31.98
As	74.92	Fe	55.91	Ta	182.114
Ba	136.76			Te	127.96
Bi	207.52	La	138.08	Th	203.71
Bo	10.94	Pb	206.47	Th	233.41
Br	79.77	Li	7.01	Sn	117.69
Cd	111.83	Mg	23.96	Ti	47.98
Cs	132.58	Mn	53.90	W	183.61
Ca	39.99	Hg	199.71	U	238.145
C	11.97	Mo	95.53	Va	51.25
Ce	140.42	Ni	57.93	Yb	172.76
Cl	35.37	N	14.02	Zn	64.90
Cr	52.01	Os	198.49	Zr	89.36
Co	58.88	O	15.963		
Nb	93.81	Pd	105.73		
Cu	63.57	P	30.96		
Di	142.12	Pt	194.41		
Er	165.89	K	39.02		
Fl	18.98	Rh	104.03		
Ga	68.85	Rb	85.23		
Gl	9.08	Ru	104.22		
Au	196.16	Sm	149.80		
H	1	Sc	43.95		
In	113.39	Se	78.79		
		Si	28.19		
		Ag	107.67		
		Na	22.99		

Precip by HS in acid Sol.

As - yellow
Sb orange
Tin Brown yel
Au } Brown
Pt } Brown
Ir } Brown
Mo Brown
Se red yellow
Te Black

} Soluble in Sulphide ammonia

Hg
Ag } black
Pb
Cu

Cd yellow
Bi Brown
Pd
Os } black
Rd } Brown
Rh

} insol in Ammon sulphide -

As Sulphide Sol in acid Sulphite of K or Sesqui
Carb Ammonia — Sb + Sn are not.
Tin reduced by Zn -

Relative affinity of Sulphur for Metals

Pd strongest
Hg
Ag
Cu
Bi
Cd
Sb
Tin

Pb
Zn
Co
Ni
Fe
As
Thal
Mn washed

portion insoluble in Sulphide NH4.
Treat with HNO_3 Hg & Pb sulphides may remain undissolved — the Sol. Pb detected by H_2SO_4 — Ag by HCl. Bi by the precipitate by NH4Cl or by K_2CrO_4 of no excess acid present.
Cu by blue color of NH4 Sol. or ferro K
Cd by precipitate of the ammoniacal Sol by Hydrosulphuric acid after the addition of KCy —

Metals precipitd by NH4y sulphide in presence of Chl of NH4y = Not to be confounded with NH4y before adding the NH4 Sulphide —

Sulphides

Ni
Co } black
Fe

Ur black brown

Mn flesh red

Zinc white

as Ox: also precip by NH4y

Al
Be
Cr
Ta
Niobium } Solm KOH green

Ce
La
Di
Yt
Er
Ter
Zr
Th
Ti } Not sol KOH Colorless

as Salts in presence of phosphates and

Mg

Ca
Sr
Ba } in presence of phos acetic Oxac or HYF acids

Precipitates by Sulphide of NH4y

Precip dissolved from KOH coll Cr Zn Al Be

Chromic — metals left in residue.

Co Ni Mn form double salts with NH4y & not precip — Fe Ur & rare metals

alkaline Earths phosphates etc are precip by NH4y Iron in presence of NH4Cl Hydrates of Ur & rare metals

Sol in Carb of NH4y Ferric hydrate less sol in alkaline Earth salts

insol — Ferric salts detected by Sulfocyn & ranges by appearance of opts

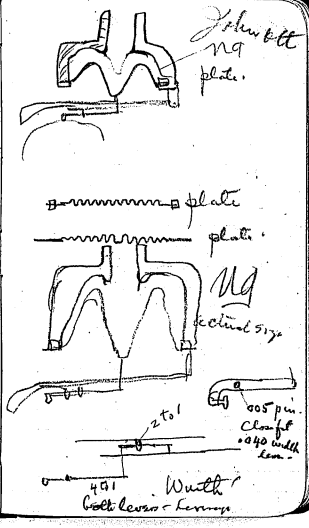
Hypophosphite Sodio is almost as good as HS in neut sol —

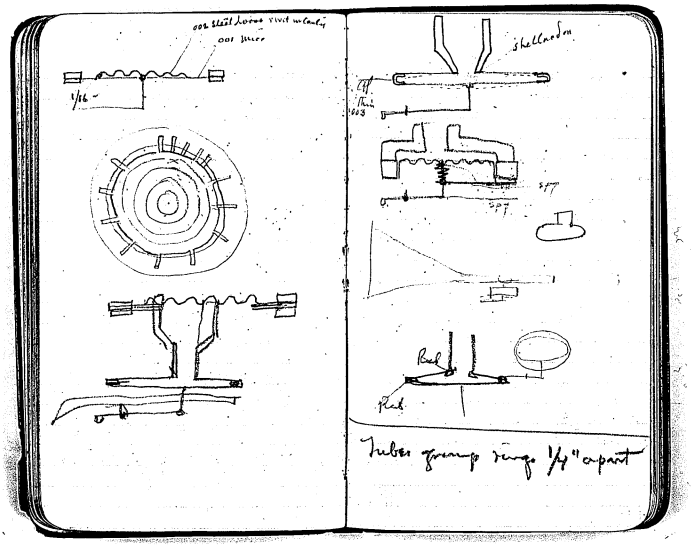
Bisulfide K dis ammo sulphide
best not Sb sulfide –

Patent Double & quadruple
dia. flexible of
Chamber compound of
chrome Connected to
Rod & pedal lever
pulled no powder
also no shine

Low oth Ing Sb in KOH
as anode,

Ask Dyer palentability
of mixing Antimonate
with glass Coal Control
Ultramarine – also
Barrite,




.002 steel horns rivet in Cavity
.001 brass
1/16
shell rod
Tubes grump rings 1/4" apart

Abt 8 oz of B. black from my Cone
salts - where it must go, —

18 Sm) Ulm 30 10 Cobalt flake
to see M Cumplimini — 21 % -

drills in 30 %

same M. Jeski,

Weight new cell

Pb Grids 6.	240. 00
180 Tubes	540 00
144 Fz Cups	360 00
Nickel Mix	1682 00
Iron Mix —	1080 00
Electrolyte	1500 00
6 Strap Holder	130 00
Can —	630 00
Rubber parts —	145 00
3 = upright Strap —	150 00
Sept 6 charged	6407 00

about 14.8 lbs lbs 17.4 watts per lb
75 %

4 1/4 1/4 1/4 1/4

Operetta,
Symphonic
Grand Home
Classic
Philharmonic
Grand
Operatic
~~Auf~~
Grand Opera
Beethoven
Orchestra
Grand Orchestra
Universal
Troubadour
Clarion
Patti
Sophrano
Lyric

4 300
1200 3
3 | 1300
433
733
1300
1386 4
1733
311.7

Shutter revolving front of Chalk cylinder & beam of light + other rays intermitted on emergent face of Chalk see of get effects X-rays etc

Diaphm - Rubber - over this ~~other~~ Mica with diaphragm hard & listening tube over well at Ft Hughes near Washington etc sounds -

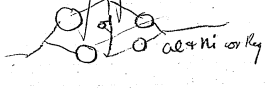
Cylinder of Shellac R S. treat for Eng

See of Scintillation from Metals with Cathodes dis. is defl. by Mag -

See of demagnetizing by knock also by alternation of an iron piece in a coil with Eng gives currents

See of an electrolyte can be found which when Zn is attacked it will form a porous ZnO or something close & sol which is electrolyte form near one of Zn Compound which has porosity, thus doing away with necessity of Eng & off to dissolve all of the Zinc —

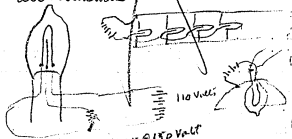
Use a 4 way aluminum reel for with Eng for wireless waves & for other waves use point grounded by glass



X 42 Eng - wet Lab 5 r
Cylinder with Compression
Chamber 1 cu Cm —
unscrew Rod, when put in
very fine grain powder if
Carbonized by and then
unscrew Rod, add K_2CO_3
Li_2CO_3 —
Try aluminate Na —

Aluminum Cylinder
Cooled with $CaCl_2O_3$ by
Current,

Quinchepate Solution affect
all varieties —



Cocaine - accounts 2/6
seems to kill transmission of
pain along nerves of this
is chlorid then Cocaine
Closed alone some Electrical
phenomenon or be the means
of conducting Nervous force
and possibly part in Kotter
b with wide a Cross connecting

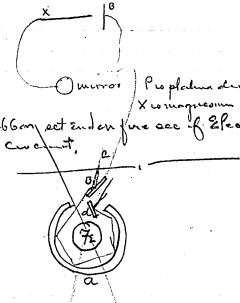
Will Cocaine affect a Sensitive
plant Venus fly trap -
will solid Cocaine affect
Nerves at a distance, thru
Matter —

Intermitting Ultra Violet light from arc in air are Quality unknown as going to give bad results and matter of low opt 500 phenomena or more phosphorescence [illegible] effect in fluorescent crystal.

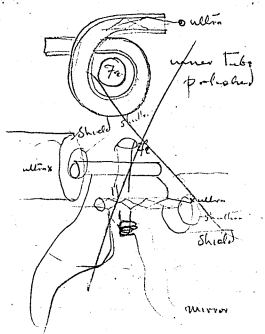
~~Thoughts~~

"fluorescence is to light what soft x rays is to elec"
phosphorescence is to light
what a [illegible] is to Elec
with fluors — the slow decay down quicker with phosphors the [illegible] remains, as minute impurities have great effect in both phosphors + fluors so impure [illegible] [illegible] [illegible] [illegible] [illegible] Sodium C 5, 86 [illegible] Etc

If 1 X ray tube gives a shot in [illegible] will 2 give it twice as short, if so a great number [illegible] tubes should have great power



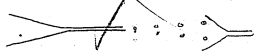
a is polished metal,
c Ultra violet ray or rays
Converging to ultra
reflected in rays out of d,
Core has on its end outside of hollow shell coil wire
Acc of Magnet wave use
shields or light,



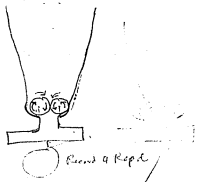
Electricity may be immaterial
Vortex rings in the Ether
of Frequency 1 to a wave
it would cling to the
cone. ~~or stick to it~~

Principal of Magnetism or Gravitation
may be due to formation of
Vortex sound waves & Chaos
Keep their direction only & reducing
spreading out instead of
increasing ~~a la smoke ring~~
~~from funnel & a smoke~~
~~& hat of 100 second~~
& Revolving Wires at Edge
of funnel & the deflection
of this wire so roughly the funnel
greater deflection Wave or Vortex

Should be able to do this



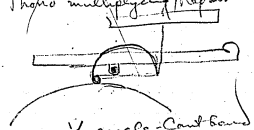
Receiving funnel & Repeat for funnel
planes of Vibrations ring formed



Velocity depends on wave length
CO_2 856 – Hydrogen 4163 Vel
increased by elasticity diminished
by density – Wiebe formula
(closed at end) molecules + disposition
air by H or one case CO_2
another ~~chlorine~~
see if any diff in Repdeg

Rotate a mass of iron of
say 2" diam at as high Vel as
possible guard it by shelf over
it of different metals making them
over it delicately suspended
see if any alteration thru
the fixed molecules of any phenomena
nat Lead Ni + other things
also phenomena the rotating body
with ~~[illegible]~~ X Rd Wave
Ultra & Light, heat,

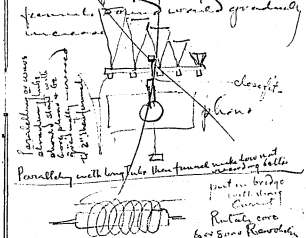
Phono multiplyer – Repdeg



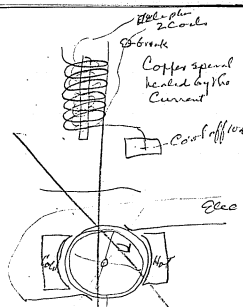
½ circle – Cant hear

Make a test record of Piccolo + go on down to lowest notes – then try funnels of every length & see if the same funnel amplifies the piccolo in same proportion as low not if not then there is either Vortex rings formed more or less perfect according to length funnel shape or length of straight part of funnel? Should any of waves were to be carried almost entirely by Vortex rings, equal then should should be found. (Were strings tubes of ~~[illegible]~~ a length better than just one length gravest note then funnel put on – with short tube piccolo would have perfect Vortex + low notes no vortex

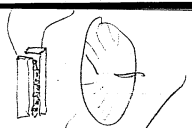
ought to have test funnels on rotating disk so could be quickly rotated + changed in fact rotated continuously short funnel then little longer + so on – on rotation of compared by changed funnels. opening varied gradually in succession



Ammended wave ends –



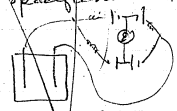
Shell of glass coated over ~~with~~
~~Silver~~ ~~nickel~~ with gold & then
plated with pure gold both -
also Ag Ni ~~Pt~~ other about
~~Pt~~ 0001 Thick rotate use hot
212 & 32 water tanks -
unequal heating showed gas
Current make long 3 mm
dia 1 inch wide breakdown



Opaque crystal: might
work dark Calcium, Mica etc
also for Heat Mica for
Ultra - opaque Crystals
ray Ruby all around all
but red ray might turn
the absorbed rays into Elec
on admission

perhaps Cals fluorescence
& phos well show
self fluorescence of gas in
Seal tube with organic
Liquids & heated to
off of at pressure
on tube fall fluorescence

all crystals in the reg system
deform in all directions alike
all other crystals
deform — specific direction



Cell with 2 electrodes
same — Bridge arrangement
Aluminum — Realfos —
Chemical reactions in
Cell or discharging Thermop
may and alternating
waves of current
Rapidly never deleterious
also use Cu wires,
Receiver also electrodes
dif parts Electrolyte scale
(not all attacked in the
Reaction —

Have the reactions
dysymmetrical in relation
to electrodes, heat one
Have reaction take place
vicinity one pole
Magnetics near one pole

Cell — al electrode plat
KOH, with Chromate
or some iodate which
H evolved will combine —
Then if no current in
outside use Cu wires
Recover of Bridge Al
Rectifier —

Try in sealed tube def
non sol crystals, use
aluminum + KOH, or
Zn + acid to make
great pressure
see if fluor or phosp
Charge red powder
pressure or amplify
poor fluorescence
Calcium Carbide
Hydro Carbon + Li3Po
H2O sufficient Carbon
with Ca Carbide to
make pressure

Try NaOH on cake with Fe Sb

CILO

60 Fe 40 Sb. One pound each
70 Fe 30 Sb
80 Fe 20 Sb from Oxalate
85 Fe 15 Sb
90 Fe 10 Sb Duplicate from precipitate
95 Fe 5 Sb from Chl Sb + Fe.

also other ways —
Self heat + Non pyro - with + without Hg
HgO to be added 5% + 10% —

Bontron Spder Salt —

Thus 90 Fe 10 Sb self heated 5% HgO
90 Fe 10 Sb " 10 "
90 Fe 10 Sb Non pyro
90 Fe 10 Sb " 5% HgO
90 Fe 10 Sb " 10% HgO

5 tests on each lot.

---

after reduction by H test race here much Sb left per ppt at all goes off as Sb H in reduction —

---

80 Fe 10 Sb 10 Bi One lb
Self heat + Non pyro - with + without HgO 5%. 10% —

---

70 Fe 30 Thalium } 1/2 lb each -
80 Fe 20 "
90 Fe 10 "
95 Fe 5 "

Self heat + Non pyro - with + without HgO 5%

---

80 Fe 20 Cerium,
90 Fe 10 " Non pyro + Self h 5% HgO —

90 Fe 20 Titanium 5% HgO

80 Fe 10 Sb 10 Cu 1 lb
with + without HgO - Self h + Non pyro

Mix with Reg Mix some Tellurs acid

Look at the Non pyro samples under Micro also bulk by weight in loading —

2869 } 1700 } 20 Bi 80 Fe
70 } 1675 } 5% Hyd non pyro

2883 } 1950 20 Sb 80 Fe
84 } 1900 5% Hyd non pyro

2885 } 1735 20 Bi 80 Fe
86 } 1730 no convey non pyro

2507 1800
2508 1800

2934 to 30 to V 47 G Non Pyro
35 1345 1300 80 Fe 20 Tungsten
39 1312 1280

2932 2150 1670 41.g. sulfide
33 2212 1757 80 Fe 20 Cu

2936 2680 2210 50.g. non pyro
37 2265 1845 80 Fe 10 Bi
20 Tin

2938 1680 - 1635 47 g sulf
39 1680 - 1655 80 Fe 20 Tungsten

2940 2165 1890 50.g sulfh
41 2185 1900 80 Fe 10% Bi
20 Sn

~~2869 2025 1700~~
2079 1645

2907-8 is Na ferrous SO4
roasted & reduced by H
~~[illegible]~~

2877- 80 Fe 20 Tin
78 5% Hyd. sulf roasted

2881 80 Fe 20 Tin
82 5% Hyd non pyro

1180 Tubs - 2400. Gross Rind 1066 1071

816

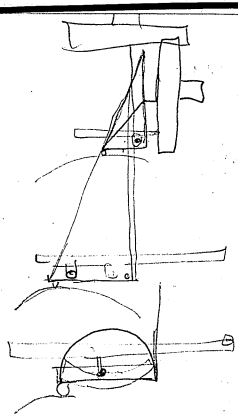
Tubes - Amp Effcy

			amp
1 Hour	94 %	73.	36
2 "	92 "	74	72
3 "	92.2 "	71.7	108
4 "	89.33 "	69.1	144
5 "	86.62 "	65.	180
6	80.20	60.2	216
7	74.5	56.1	
9	66.2	49.5	
12	54.6	40	
	37.3	34.7	

Big Cell [illegible]

156	77th	161st
157	127	115
160	125	100
158	123	101

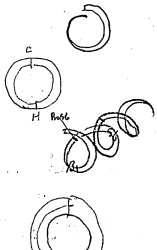
150 Runs probably expired 16 months when not resulted 24 months resulted in [illegible]



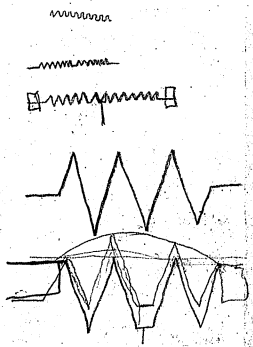
½ — 20 — also build up furnace 18 from 1/2 inch 2 feet of

1 see W with new reflector - question new drawing
2 Process by Mr Cl's Silica lined Crucible Podlin's Journal.
3. Moyer about Drain shelves.
4 Iron Silicate, slag - pour for Drain
5= Round Brass Curves like Hg
6 Try SO_4 - on final res. Lead with SO_4 Mach
7 Cracking = Crucibles for plating flake
8 Lip plates of Fe in Cu By Aq. Sn Sb
9 Sep Cu from Co using Cl Hl + Hl by in Hl and dilute Sulphuric, = Electrolysis with inert anode
10 Try Hl Sulphide to separate Ni in 1 Co Cu
11 - Copper foil (Collate Mix with Hl)
12 Cracking Nickle Copper foil with Zinc + or Iron + Hl Sol so not to reduce
13 Jobatt charge slag pp. Ni - no bin of Cobalt
14 Cracking tray plate Co only dip Copper. See if work without plating Cop. only dip
15 - glass 200 mesh free Calm roast with 200 mesh acid, - moisture -
16 Jl Miller furnace 1000 g fuse of Diorite
17 glass slow low temp roast long time Fro off to help

18 Try 200 mesh mass with Blende + heat.
19 - heat in HS.
20 - Melt roasted ore in $ZnSO_4$ -



Francis Bacon
15475 lbs 49 577
#1. daily 50@62
alumina 24 to 28
Ferric ox —

Ca-Ala
1904 21913 lbs
aluminum 25000
Value $550/100
highest grade

~~[illegible] Co~~ most all
Niagara Electric Chem Co
buy it for all salts